Electronic Health Record Implementation in Community Nursing Homes

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Introduction: The Electronic Health Record (EHR) is being advocated as a tool to improve patient care. Nationwide initiatives are under way to determine how to implement EHR. To date, community nursing homes have not been involved in that effort. Many reasons, including multiple providers in a home, physical structure of a facility, multiple facilities, high costs of implementation, and maintenance of an EHR, hinder efforts to establish such a record in a nursing home. Convinced that an EHR would improve resident care, we undertook a project to establish an EHR in 11 community nursing homes.

Methods: Boston University Geriatric Services and Boston Medical Center partnered with 11 community nursing homes in the Boston, MA, area to introduce GE Centricity as the medical provider's medical record-for the residents under the care of this medical practice. This effort included allowing the software to be used at various sites, providing hardware, and establishing Internet connectivity.

Results: All 11 of the nursing homes served by Boston University Geriatric Services have been connected to the system.

Discussion: It is possible to establish an EHR in a diverse, unrelated group of nursing homes. This has allowed for improved communication between providers, consultants, hospital, and nursing home staff. **(J Am Med Dir Assoc 2007; 8: 31–34)**

Keywords: Electronic health record; nursing homes

Electronic health records (EHR) are being promulgated as a strategy to provide "more safe, effective, patient-centered, timely, efficient, and equitable health care."[1] Organizations such as the American Medical Association and insurance consortiums, as well as the federal government, have endorsed the concept.[1,2] However, Chaudry et al[3] state that most data on implementing multifunctional health information technology systems in health care settings outside large hospitals or hospital systems are lacking. Much of the effort to date has centered on hospital care and large medical practices. An example of this is the Department of Veterans Affairs. It has an extensive EHR linking all of its facilities including its nursing homes. While efforts to allow versions of the VA EHR to be commercially available are under way, no effort is directed at community nursing homes. Furthermore, the federal effort focuses on the doctor's office. Again, community nursing homes are being ignored. For a variety of reasons, primarily financial, most nursing homes lack electronic health records for their residents. Handwritten charting, progress notes, and written communication among nursing homes, hospitals, and doctors remain the standard of practice.

Transfer of information from the nursing home to the hospital or consultant and vice versa often is missing or deficient. While direct person-to-person communication is often considered the standard, there can be lag times in reaching providers or incomplete information may be given. Ironically, Bludau[4] asserts that to improve care in the nursing homes and their sub-acute care units, handwritten or telephone communication between nursing homes and hospitals should be used. Yet, handwriting may be illegible, the writer may not know pertinent information; critical forms, such as advance directives, may not accompany the patient; clinical details, such as nursing home evaluation to date or laboratory or radiological test results, may not be available at the time of transfer; and oral communication may not be detailed enough or complete.

Adverse effects, such as drug reactions, abdominal pain, and dehydration often occur after patients are discharged from

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the hospital, and may be preventable if systems for tracking are in place.[5,6] In addition, patients are discharged from the hospital with pending test results. Frequently a new provider will assume care in a sub-acute unit, skilled nursing facility, or a nursing home. These providers are often unaware of pending test results.[7]

The current standard is that upon transfer from a hospital to a nursing facility, the transfer information should include a discharge summary, lists of diagnoses, medications, treatments, and future appointments. Notes from nurses, therapists, and social workers should also accompany the patient. Often this documentation is lacking or incomplete. Several authors propose written forms to achieve improved communication goals.[8,9] An EHR can a potentially rectify the situation. Yet, EHR implementation in nursing homes is still in the developmental phase.[10] As Chaudry et al[3] state that benefits of EHR are clear in theory, adapting one is difficult and has been limited to date. Little information exists regarding actual experience with implementation of an EHR in nursing homes. We describe an experience with an EHR in community nursing homes served by an academic nursing home program.

DESCRIPTION OF PRACTICE

Boston University Geriatric Services (BU Geriatric Services) is an integrated model of care and case management composed of 15 doctors, 6 nurse practitioners, 4 nurse case managers, and a social worker. It is an academic practice part of the BU School of Medicine and provides required educational rotations for all fourth year medical students and the majority of internal medical residents. BU Geriatric Services provides primary and consultant care for more than 2000 frail elders in an ambulatory practice, in a home care program, a hospital inpatient service, and serves 11 nursing homes in Boston, MA. Patients remain in the practice as they transition from one site to another. Clinically, 2 physician full-time equivalents (FTE) and 4.5 nurse practitioner FTE are devoted to the nursing home practice. BU Geriatric Services, the geriatric clinical program for Boston Medical Center (BMC), the primary teaching hospital for Boston University School of Medicine, makes use of BMC for consultation and hospitalization for its patients.

METHODS

In 2000, BMC employed Logician, now known as GE Centricity, as its office-based EHR. Centricity is designed to serve a large institution and connect office visits, laboratory results, and radiological results. It functions in real time when the provider is online. It was not designed to be portable or easily used outside the institution. There is no "downloadable" version that can be transported from place to place. While it can be accessed from outside the hospital via the Web, security limits are in place, reducing functionality from outside the institution. This also ensures HIPAA compliance, since no data reside on the laptop computer. Even if the computer is stolen, no patient information would be compromised. Moreover, none of our nursing homes had direct Internet access available on the nursing units at the start of the project.

Convincing the Hospital to Allow Outside Access

BU Geriatric Services first introduced Centricity into its ambulatory practice. While the hospital asked for no pilot data as to productivity or cost savings, it took a position similar to one elucidated by the former National Health Information Technology (IT) Coordinator, Dr David J. Brailer, who stated, "We're at the point of irreversible recognition that the electronic health record is an essential information tool in the doctor's office."[11] We argued that the doctor's office includes the nursing home. Two meetings were held with the hospital vice president for clinical services, director of IT, IT hardware support technician, chief of geriatrics, administrator for the geriatric section, and medical director of the nursing home practice to discuss the concept. Additional subgroup meetings were held during the next year to discuss the practicality of the concept and convince the medical center to support an EHR for the nursing home practice. Concerns that arose included "whose patients are these?" These patients live in nursing homes and nursing homes have separate medical records; the medical center was concerned that these patients were not truly part of their system of care. However, these patients do not differ from other patients who come to the hospital or office for their care. Moreover, we were concerned about transitions of care and assumptions that might be made about patients in our practice without up-to-date EHR records. BMC administration agreed to allow its IT department to devote time to this project. Since all nursing homes serviced by BU Geriatric Services have a written chart, a printed copy of a note would need to be placed in the patient's chart at the nursing home. An additional hurdle became the task of allowing offsite printing. Offsite printing of Centricity documents was prohibited to limit the potential exposure of patient records. IT at BMC overcame this obstacle by configuring the laptop computers that were going to be deployed via a unique secure gateway to "think" that they were onsite, while actually they were miles away.

Training of physicians and nurse practitioners on Centricity took 4 hours of formal classroom instruction. While the teaching session was comprehensive, translating training into efficiency takes several months of continued use. While trying to maximize experience while minimizing effect on productivity, a phased approach of introducing Centricity was employed. Initially, it was instituted in one home at a time.

Cost of the computers and printers was another major consideration, since each provider needed a complete computer set-up. After the printing issues were resolved by IT personnel, the medical center supplied the physicians and nurse practitioners with laptops and portable printers. The laptops were wireless-ready, Dell Latitude Pentium M PCs running Microsoft Windows 2000 Professional (subsequently some have been upgraded to Windows XP professional). The cost per laptop was approximately $1600; the HP 450 printer was $250 and the rolling case for the system was $100. All work was done by BMC IT; GE Centricity was not involved.

The costs of configuration and installation of programs for the 10 laptops took 20 hours. Although the work was done "in-house," if one were to purchase technology assistance in the marketplace, an estimate of $125 per hour; the total cost of preparing the computers would have been $2500.[12]

Convincing Nursing Homes to Cooperate

Another major obstacle to overcome was real-time connection. Since GE Centricity is not downloadable, the computers at the nursing homes need to be online with the hospital server. Allowing stable and secure connections from different sites needed to be established. At the start of this project, none of the 11 nursing homes with whom we are affiliated had Internet connections at the nurses' stations or on patient units. Some had high-speed via DSL or cable modem access for administrative use; some only had dial-up; none had wireless connectivity.

The homes varied as to size based on number of beds and ownership. The number of beds per home ranged from 50 to 350. Two of the 11 homes were part of national chains, 3 were independent homes, and the rest were part of local groups of 2 or 3 homes. As we approached each facility's administration, we met with varying responses. The smaller homes embraced the concept more readily than the larger homes. We explained the advantages of having legible, printed notes in the chart. We argued that access to hospital laboratory and x-ray results would improve care. Furthermore, costs to the nursing home would decrease since test results from the hospital could be easily accessed eliminating redundancy of testing. Seamless care between consultants and primary care providers would occur since each would have access to each other's notes. Potential errors due to lost or misdirected information would be minimized.

RESULTS

As a pilot project in 2004, the administrators of 2 of our smallest (50 and 80 beds) homes provided direct Ethernet connections at each nurse's station. Every home used a consultant or vendor to provide initial connection. These consultants made sure that the Internet was available in each home. Once that was established, the start-up phase of the project was not without difficulty, however. Initially, dropped connections, the program freezing, and printing problems occurred. The BMC IT department worked closely with us to correct all these problems. As long as the Internet was available in the home, we could connect to Centricity. As connections improved and as patient records were loaded into the system, we expanded one home at a time. Most homes provided high-speed Ethernet connections. One of our largest homes had only dial-up access when we started. Despite slower connections and recording, we still included this home. When the home realized the benefits, it installed 1 high-speed line. The cost of adding a DSL line from the server is $100 per unit (J. Burke, BS, oral communication, May 22, 2006). Other homes have installed secure wireless network, so access is available on its nursing units. The homes that used a consultant firm spent approximately $1,000 to install a wireless system (T. Lynch, BS, written communication, May 27,

2006). After 15 months, we were totally connected in 8 of 11 homes. By 2 years, we were connected in all homes. However, paper charts remain in the nursing homes. Since the nursing home staff cannot access the EHR because they do not have computer access on each unit, and they do not have passwords for Centricity, the notes are printed and placed in the chart.

We have also successfully piloted the use of a wireless service. While connecting via a land line or local wireless incurs a one-time cost, the use of a general wireless carrier service results in a monthly charge of approximately $80. Wired connections have also proven to be more consistent that local wireless or wireless carriers. Additional ongoing costs are involved. The most prevalent recurring expense is replacement of the printer ink cartridges. They need to be changed approximately every 6 weeks at a cost of $15/cartridge when bought in bulk. Computer and printer repair needs to be budgeted, but is unpredictable. These costs are not shared with the nursing homes. Costs of maintaining the networks in the nursing homes are also not shared and are the responsibility of the nursing home. Since the laptops and printers are brought to the home by the provider each day, it takes approximately 5 to 7 minutes to set up the equipment and connect. For nursing homes that have several units or floors, the laptops are generally not moved during the day. However, they are designed to move from unit to unit, if needed, or if the practitioner desires. Patients are seen and then the charts are brought to the computer for entering the note.

Since data were not collected prospectively, specific numbers for the phase-in period are not available. However, review of total number of visits by physicians and nurse practitioners in the year prior to the project, during the project, and currently shows no overall change in total encounters. We also retrospectively reviewed the Current Procedural Terminology (CPT) coding trends before, during, and after implementation. While we observed individual variation, no overall change in CPT coding was found across the practice. Other confounding factors may have influenced these numbers, such as simultaneous, ongoing seminars devoted to proper coding and billing procedures.

DISCUSSION

It is possible to implement an EHR in the nursing home setting. Ideally, an EHR would be specifically designed for nursing home use. However, since our affiliated hospital and its practices use GE Centricity, adapting it for our practice would maximize continuity of care. GE Centricity is not designed to be a nursing home product. We demonstrated that a nursing home electronically connected EHR can be implemented with IT support. Others, such as Erickson Health Systems, have also implemented an EHR across their clinics and nursing facilities.[13] Erickson and the VA are closed systems. We have taken the process further by integrating community nursing homes with a medical center and consultant care.

Implementation of such a system is challenging. All participants—the medical center, its IT department, individual nursing homes, and clinicians—cooperated to allow the

project to succeed. In addition to hardware costs, many hours were spent working with IT and the nursing homes. At times frustration levels were high when the systems would not work. Entering new patient data into the system is time consuming. Since GE Centricity was not developed for nursing home care, templates needed to be developed and modified for use. Carrying the equipment and setting up in different homes can be taxing. The majority of the nursing homes were built before the computer age and work space is limited. The nursing homes use different laboratory and radiology vendors than BMC. Therefore, results are not available electronically. These data must be entered by hand into the database template, which takes time (seconds to minutes depending on volume). Hand entering can introduce error, but the benefit outweighs the risk since the labs become available, traceable data and trends can be viewed and outliers noticed. Recently, the contracted mobile radiology service for many of our nursing homes has placed its x-rays on line (Mobile Medical Radiography and EKG, Inc, written communication, July 11, 2006). These remain outside the EHR since no interface between the x-ray vendor and Centricity exists. Since the laptops are Internet connected, we can view the actual x-rays taken at the nursing home. Again, images are not stored on the laptops but just viewed.

There was a learning curve for the providers with both the hardware and the software. Depending on one's computer literacy, it can take up to several months to become comfortable with the system.[3] Since a phased approach was employed, overall visits by practitioners as measured by number of encounters remained constant. This is consistent with previous studies that have shown mixed results of EHR on provider time.[3] In addition, the percentage of visits by CPT codes did not change overall. Efficiency is improved with consultant reports, labs, and radiology reports and images immediately available. There is also direct access to online medical textbooks and other clinical resources. This allows the provider to review more data, address problems more thoroughly, and directly communicate with consultants more easily. While this improves patient care, it involves more time than previously. The reimbursement system does not compensate providers for this extra work. Although we feel more thorough and better patient care is being accomplished via the EHR, it may not be reflected in increased productivity. To improve productivity, the EHR needs to become more nursing home friendly.

We believe we have improved nursing home care. Communication between providers across institutions has improved. Data and notes are now available at any site with access to the Internet. Follow-up services can also be arranged when a patient is ready to return home. Hospital and nursing home information is available simultaneously at either site. Future evaluation efforts will determine if medical errors will be impacted. In addition, other nursing home vendors that provide laboratory, radiology, and electrocardiogram services to nursing homes have begun placing results online.

Is the process described herein generalizable? We believe it is. The EHR that we use is commercially available. While it is not designed for nursing home use, it is adaptable. It is being used in a variety of community nursing homes—small, large, independent, and part of a chain—and the clinicians using it have a range of typing and computer skills. This EHR is based in a large medical center practice. It may not be directly applicable to the individual practitioner. While the nursing home EHR is operational, it is still in its infancy. Except for our documentation, most of the nursing home chart is handwritten or includes printouts of radiology reports, for instance. Therefore, currently a paper chart that includes our notes exists in each nursing home. Moreover, practitioners, organizations, and vendors will strive to integrate and expand EHR—and the nursing home industry needs to be included. Despite all the obstacles, frustrations, and time commitments associated with implementing a nursing home EHR, none of our providers or the nursing homes would go back to a nonelectronic system.

ACKNOWLEDGMENTS

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